

Full SAP Calculation Printout



Plot Reference	UNIT 14			Issued on Date	08/07/2026
Assessment Reference	001	Plot Type Ref	UNIT 14		
Plot Address	UNIT 14, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS			SAP Version	10.2
SAP Rating	83 B	DER	17.08	TER	18.05
Environmental	88 B	% DER < TER			5.37
CO ₂ Emissions (t/year)	0.81	DFEE	43.56	TFEE	45.42
Compliance Check	See BREL	% DFEE < TFEE			4.08
% DPER < TPER	0.98	DPER	96.16	TPER	97.11
Assessor Details	Mr. Ondrej Gajdos			Assessor ID	W452-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.6000 (1b)	2.7500 (2b)	141.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		141.9000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.9000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
dl			2.1000	1.0000	2.1000		(26)
l			22.6900	0.7940	18.0149		(27)
exposed wall	45.1000	22.6900	22.4100	0.1500	3.3615	60.0000	1344.5999 (29a)
corridor wall		2.1000	17.1500	0.3100	5.3165	14.0000	240.1000 (29a)
flat roof	51.6000		51.6000	0.1000	5.1600	9.0000	464.4000 (30)
Total net area of external elements Aum(A, m ²)			115.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9529		(33)
Main dwelling							
pw			21.7250	0.0000	0.0000	110.0000	2389.7500 (32)
pf			51.6000			40.0000	2063.9999 (32d)
iw			118.2500			9.0000	1064.2500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7567.0999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							146.6492 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.4500	0.0500	0.5225
E3 Sill	9.4500	0.0500	0.4725
E4 Jamb	26.1000	0.0500	1.3050
E7 Party floor between dwellings (in blocks of flats)	16.3000	0.0700	1.1410
E9 Balcony between dwellings, wall insulation continuous	1.5000	0.0200	0.0300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5000	0.0200	0.1100
E24 Eaves (insulation at ceiling level - inverted)	5.4000	0.0800	0.4320
E14 Flat roof	7.1000	0.1600	1.1360
E15 Flat roof with parapet	16.3000	0.5600	9.1280
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0900	-0.7425
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E25 Staggered party wall between dwellings	2.7500	0.0600	0.1650
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.8545 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	48.8074 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.3892	11.2531	11.1170	10.4366	10.3005	9.6200	9.6200	9.4839	9.8922	10.3005	10.5727	10.8448 (38)
Average = Sum(39)m / 12 =	60.1966	60.0605	59.9244	59.2440	59.1079	58.4274	58.4274	58.2913	58.6996	59.1079	59.3801	59.6523 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1666	1.1640	1.1613	1.1481	1.1455	1.1323	1.1323	1.1297	1.1376	1.1455	1.1508	1.1561 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.7373 (42)
Hot water usage for mixer showers	53.3478	52.5461	51.3778	49.1426	47.4930	45.6535	44.6079	45.7673	47.0382	49.0133	51.2966	53.1434 (42a)
Hot water usage for baths	23.0645	22.7220	22.2396	21.3502	20.6842	19.9458	19.5469	20.0259	20.5474	21.3376	22.2453	22.9866 (42b)
Hot water usage for other uses	32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214 (42c)
Average daily hot water use (litres/day)												100.0433 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	108.8337	106.5105	103.6809	99.3773	95.8828	92.1258	90.6814	93.4987	96.4701	100.4144	104.7844	108.5513 (44)
Energy content (annual)	172.3660	151.6695	159.3537	136.0426	129.0767	113.2795	109.6712	115.7709	118.9573	136.2614	149.2845	169.9652 (45)
Distribution loss (46)m = 0.15 x (45)m	25.8549	22.7504	23.9031	20.4064	19.3615	16.9919	16.4507	17.3656	17.8436	20.4392	22.3927	25.4948 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.0080	48.8608	45.4319	46.2102	47.6459	47.5743	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	223.3249	197.6969	210.3126	185.0506	177.9376	158.7114	155.8815	163.4169	166.5317	187.2203	198.5996	220.9241 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
FV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	223.3249	197.6969	210.3126	185.0506	177.9376	158.7114	155.8815	163.4169	166.5317	187.2203	198.5996	220.9241 (64)
12Total per year (kWh/year)												2245.6079 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	70.0514	61.9370	65.7248	57.4862	55.1332	49.0234	48.0182	50.4053	51.4469	58.0466	61.9659	69.2531 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.3580	84.5392	76.3580	78.9032	76.3580	78.9032	76.3580	76.3580	78.9032	76.3580	78.9032	76.3580 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908 (71)
Water heating gains (Table 5)	94.1551	92.1681	88.3398	79.8419	74.1038	68.0881	64.5406	67.7491	71.4540	78.0197	86.0637	93.0822 (72)
Total internal gains	373.9603	381.7254	365.7572	351.3769	332.4552	315.9862	303.2139	304.8514	315.0603	330.5083	351.7360	366.2077 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	or Table 6c							
Northeast	5.2500	11.2829	0.5300	0.7000	0.7700	15.2296 (75)						
Southeast	17.4400	36.7938	0.5300	0.7000	0.7700	164.9790 (77)						
Solar gains	180.2086	312.0206	440.3568	568.1455	656.9273	661.2191	633.7227	566.1051	484.3941	348.4721	216.7696	153.6249 (83)

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Total gains 554.1689 693.7460 806.1141 919.5224 989.3825 977.2053 936.9366 870.9565 799.4544 678.9804 568.5055 519.8326 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	34.9184	34.9976	35.0770	35.4799	35.5616	35.9758	35.9758	36.0598	35.8090	35.5616	35.3986	35.2371
alpha	3.3279	3.3332	3.3385	3.3653	3.3708	3.3984	3.3984	3.4040	3.3873	3.3708	3.3599	3.3491
util living area	0.9331	0.8775	0.7975	0.6674	0.5187	0.3735	0.2719	0.3040	0.4803	0.7315	0.8893	0.9433 (86)
MIT	19.5002	19.8988	20.3045	20.6816	20.8873	20.9722	20.9928	20.9895	20.9349	20.6352	20.0132	19.4232 (87)
Th 2	19.9468	19.9489	19.9511	19.9617	19.9638	19.9745	19.9745	19.9767	19.9703	19.9638	19.9596	19.9553 (88)
util rest of house	0.9217	0.8589	0.7695	0.6279	0.4694	0.3167	0.2096	0.2380	0.4165	0.6871	0.8690	0.9334 (89)
MIT 2	18.2472	18.7340	19.2177	19.6526	19.8687	19.9565	19.9714	19.9718	19.9241	19.6190	18.8923	18.1581 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6260	19.0861	19.5463	19.9637	20.1766	20.2636	20.2802	20.2795	20.2297	19.9263	19.2312	18.5405 (92)
Temperature adjustment												
adjusted MIT	18.4760	18.9361	19.3963	19.8137	20.0266	20.1136	20.1302	20.1295	20.0797	19.7763	19.0812	18.3905 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9014	0.8378	0.7530	0.6219	0.4725	0.3245	0.2191	0.2479	0.4235	0.6783	0.8484	0.9143 (94)
Useful gains	499.5497	581.2337	607.0103	571.8357	467.5007	317.1346	205.3216	215.9449	338.5518	460.5501	482.3344	475.3066 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	853.3470	843.0177	772.8023	646.5717	492.1687	322.1448	206.2619	217.3962	351.0039	542.3890	711.4441	846.4977 (97)
Space heating kWh	263.2252	175.9189	123.3493	53.8100	18.3530	0.0000	0.0000	0.0000	0.0000	60.8881	164.9590	276.1662 (98a)
Space heating requirement - total per year (kWh/year)												
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												
Space heating kWh	263.2252	175.9189	123.3493	53.8100	18.3530	0.0000	0.0000	0.0000	0.0000	60.8881	164.9590	276.1662 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
Space heating per m2	(98c) / (4) =											

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	263.2252	175.9189	123.3493	53.8100	18.3530	0.0000	0.0000	0.0000	0.0000	60.8881	164.9590	276.1662 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	296.0913	197.8840	138.7506	60.5287	20.6445	0.0000	0.0000	0.0000	0.0000	68.4906	185.5557	310.6481 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	223.3249	197.6969	210.3126	185.0506	177.9376	158.7114	155.8815	163.4169	166.5317	187.2203	198.5996	220.9241 (64)
Efficiency of water heater	84.7346	84.1322	83.2782	82.0890	81.0329	80.3000	80.3000	80.3000	80.3000	82.2527	83.9864	80.3000 (216)
Fuel for water heating, kWh/month	263.5580	234.9837	252.5421	225.4269	219.5867	197.6481	194.1239	203.5079	207.3869	227.6160	236.4662	260.3371 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.6715	12.3484	13.6715	13.2305	13.6715	13.2305	13.6715	13.6715	13.2305	13.6715	13.2305	13.6715 (231)
Lighting	15.8657	12.7280	11.4602	8.3962	6.4855	5.2987	5.9163	7.6902	9.9888	13.1059	14.8030	16.3066 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1278.5934 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2723.1835 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)												
mechanical ventilation fans (SFP = 0.6930)												119.9708 (230a)
central heating pump												41.0000 (230c)

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Total electricity for the above, kWh/year	160.9708	(231)
Electricity for lighting (calculated in Appendix L)	128.0451	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4290.7928	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1278.5934	0.2100	268.5046 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2723.1835	0.2100	571.8685 (264)
Space and water heating			840.3732 (265)
Pumps, fans and electric keep-hot	160.9708	0.1387	22.3286 (267)
Energy for lighting	128.0451	0.1443	18.4809 (268)
Total CO2, kg/year			881.1826 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.0800 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1278.5934	1.1300	1444.8106 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2723.1835	1.1300	3077.1973 (278)
Space and water heating			4522.0079 (279)
Pumps, fans and electric keep-hot	160.9708	1.5128	243.5166 (281)
Energy for lighting	128.0451	1.5338	196.3998 (282)
Total Primary energy kWh/year			4961.9243 (286)
Dwelling Primary energy Rate (DPER)			96.1600 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	51.6000	2.7500	141.9000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		141.9000
Dwelling volume			141.9000

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1409 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3909 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3030 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3863	0.3787	0.3712	0.3333	0.3257	0.2878	0.2878	0.2803	0.3030	0.3257	0.3409	0.3560 (22b)
Effective ac	0.5746	0.5717	0.5689	0.5555	0.5530	0.5414	0.5414	0.5393	0.5459	0.5530	0.5581	0.5634 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
---------	-------	----------	---------	---------	-------	---------	-------

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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			10.8000	1.1450	12.3664		(27)
exposed wall	45.1000	10.8000	34.3000	0.1800	6.1740		(29a)
corridor wall	19.2500	2.1000	17.1500	0.1800	3.0870		(29a)
flat roof	51.6000		51.6000	0.1100	5.6760		(30)
Total net area of external elements Aum(A, m2)			115.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.4034		(33)
Main dwelling							
pw			21.7250	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 146.6492 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	10.4500	0.0500	0.5225
E2 Other lintels (including other steel lintels)	9.4500	0.0500	0.4725
E3 Sill	26.1000	0.0500	1.3050
E4 Jamb	16.3000	0.0700	1.1410
E7 Party floor between dwellings (in blocks of flats)	1.5000	0.0200	0.0300
E9 Balcony between dwellings, wall insulation continuous	5.5000	0.0200	0.1100
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.4000	0.2400	1.2960
E24 Eaves (insulation at ceiling level - inverted)	7.1000	0.0800	0.5680
E14 Flat roof	16.3000	0.5600	9.1280
E15 Flat roof with parapet	11.0000	0.0900	0.9900
E16 Corner (normal)	8.2500	-0.0900	-0.7425
E17 Corner (inverted - internal area greater than external area)	2.7500	0.0600	0.1650
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E25 Staggered party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.1505 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.5539 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.9075	26.7718	26.6388	26.0142	25.8973	25.3533	25.3533	25.2525	25.5628	25.8973	26.1337	26.3809
Heat transfer coeff	71.4614	71.3257	71.1927	70.5681	70.4512	69.9072	69.9072	69.8064	70.1167	70.4512	70.6876	70.9348
Average = Sum(39)m / 12 =												70.5675
HLP	1.3849	1.3823	1.3797	1.3676	1.3653	1.3548	1.3548	1.3528	1.3589	1.3653	1.3699	1.3747
HLP (average)												1.3676
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

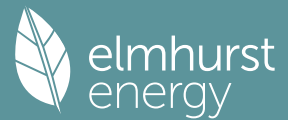
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7373 (42)
Hot water usage for mixer showers	53.3478	52.5461	51.3778	49.1426	47.4930	45.6535	44.6079	45.7673	47.0382	49.0133	51.2966	53.1434	(42a)
Hot water usage for baths	23.0645	22.7220	22.2396	21.3502	20.6842	19.9458	19.5469	20.0259	20.5474	21.3376	22.2453	22.9866	(42b)
Hot water usage for other uses	32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214	(42c)
Average daily hot water use (litres/day)												100.0433	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8337	106.5105	103.6809	99.3773	95.8828	92.1258	90.6814	93.4987	96.4701	100.4144	104.7844	108.5513	(44)
Energy content (annual)	172.3660	151.6695	159.3537	136.0426	129.0767	113.2795	109.6712	115.7709	118.9573	136.2614	149.2845	169.9652	(45)
Distribution loss (46)m = 0.15 x (45)m	25.8549	22.7504	23.9031	20.4064	19.3615	16.9919	16.4507	17.3656	17.8436	20.4392	22.3927	25.4948	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.0080	48.8608	45.4319	46.2102	47.6459	47.5743	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	223.3249	197.6969	210.3126	185.0506	177.9376	158.7114	155.8815	163.4169	166.5317	187.2203	198.5996	220.9241	(62)
WWHRS	-24.3884	-21.5693	-22.5861	-18.7022	-17.4298	-14.9148	-13.9802	-14.8666	-15.4314	-18.1919	-20.6092	-23.9368	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	198.9365	176.1276	187.7265	166.3484	160.5078	143.7966	141.9012	148.5503	151.1002	169.0284	177.9903	196.9873	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2019.0012	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month	70.0514	61.9370	65.7248	57.4862	55.1332	49.0234	48.0182	50.4053	51.4469	58.0466	61.9659	69.2531	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5856	84.7912	76.5856	79.1384	76.5856	79.1384	76.5856	76.5856	79.1384	76.5856	79.1384	76.5856
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908
Water heating gains (Table 5)	94.1551	92.1681	88.3398	79.8419	74.1038	68.0881	64.5406	67.7491	71.4540	78.0197	86.0637	93.0822
Total internal gains	374.1879	381.9775	365.9849	351.6122	332.6829	316.2214	303.4415	305.0790	315.2955	330.7359	351.9712	366.4353

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6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast			2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)
Southeast			8.3000	36.7938	0.6300	0.7000	0.7700	93.3308 (77)
Solar gains	101.9513	176.5242	249.1338	321.4372	371.6725	374.1030	274.0502	86.9117 (83)
Total gains	476.1393	558.5017	615.1187	673.0493	704.3553	690.3245	589.3457	453.3470 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	29.4141	29.4700	29.5251	29.7864	29.8359	30.0681	30.0681	30.1114	29.9782	29.8359	29.7361	29.6325
alpha	2.9609	2.9647	2.9683	2.9858	2.9891	3.0045	3.0045	3.0074	2.9985	2.9891	2.9824	2.9755
util living area	0.9594	0.9357	0.9003	0.8301	0.7216	0.5729	0.4386	0.4773	0.6718	0.8562	0.9375	0.9643 (86)
MIT	18.8627	19.1831	19.6098	20.1398	20.5715	20.8482	20.9495	20.9339	20.7434	20.1814	19.4342	18.8049 (87)
Th 2	19.7749	19.7769	19.7789	19.7883	19.7900	19.7982	19.7982	19.7997	19.7950	19.7900	19.7865	19.7828 (88)
util rest of house	0.9513	0.9233	0.8808	0.7963	0.6654	0.4871	0.3290	0.3664	0.5914	0.8199	0.9233	0.9572 (89)
MIT 2	17.3440	17.7448	18.2743	18.9192	19.4110	19.6965	19.7766	19.7691	19.6047	18.9869	18.0726	17.2763 (90)
Living area fraction									fLA = Living area / (4) =			0.3023 (91)
MIT	17.8031	18.1796	18.6781	19.2882	19.7619	20.0447	20.1312	20.1212	19.9489	19.3480	18.4843	17.7385 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8031	18.1796	18.6781	19.2882	19.7619	20.0447	20.1312	20.1212	19.9489	19.3480	18.4843	17.7385 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9334	0.9022	0.8590	0.7801	0.6640	0.5058	0.3606	0.3976	0.6026	0.8040	0.9032	0.9404 (94)
Useful gains	444.4183	503.9079	528.3838	525.0767	467.6585	349.1777	238.7078	248.6210	355.1685	424.4425	428.6856	426.3357 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	964.9505	947.1800	866.9892	733.0770	567.9691	380.6207	246.8559	259.7638	410.1085	616.3106	804.7262	960.3496 (97)
Space heating kWh	387.2759	297.8789	251.9224	149.7602	74.6311	0.0000	0.0000	0.0000	0.0000	142.7498	270.7492	397.3064 (98a)
Space heating requirement - total per year (kWh/year)												1972.2739
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	387.2759	297.8789	251.9224	149.7602	74.6311	0.0000	0.0000	0.0000	0.0000	142.7498	270.7492	397.3064 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1972.2739
Space heating per m2										(98c) / (4) =		38.2224 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	387.2759	297.8789	251.9224	149.7602	74.6311	0.0000	0.0000	0.0000	0.0000	142.7498	270.7492	397.3064 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	419.1298	322.3798	272.6433	162.0782	80.7696	0.0000	0.0000	0.0000	0.0000	154.4911	293.0186	429.9853 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	198.9365	176.1276	187.7265	166.3484	160.5078	143.7966	141.9012	148.5503	151.1002	169.0284	177.9903	196.9873 (64)
Efficiency of water heater (217)m	85.7823	85.4976	85.0124	84.1570	82.8436	80.3000	80.3000	80.3000	80.3000	84.0215	85.2774	85.8523 (216)
Fuel for water heating, kWh/month	231.9087	206.0029	220.8226	197.6644	193.7479	179.0742	176.7139	184.9941	188.1697	201.1728	208.7192	229.4491 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	15.9130	12.7660	11.4943	8.4213	6.5048	5.3145	5.9339	7.7131	10.0186	13.1449	14.8472	16.3552 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-9.8504	-14.9527	-23.1257	-28.0490	-32.0951	-30.6566	-30.2971	-27.6773	-23.3969	-17.9762	-11.2048	-8.3975 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-2.7417	-5.9543	-12.1892	-18.8385	-25.4332	-25.7364	-25.4213	-21.2720	-15.2738	-8.6724	-3.7107	-2.1536 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2134.4956	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2418.4395	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												128.4268	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-425.0765	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4342.2854	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2134.4956	0.2100	448.2441	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2418.4395	0.2100	507.8723	(264)
Space and water heating			956.1164	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4268	0.1443	18.5360	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-257.6794	0.1331	-34.2854	
PV Unit electricity exported	-167.3972	0.1251	-20.9384	
Total			-55.2237	(269)
Total CO2, kg/year			931.3578	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.0500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2134.4956	1.1300	2411.9800	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2418.4395	1.1300	2732.8366	(278)
Space and water heating			5144.8167	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4268	1.5338	196.9853	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-257.6794	1.4917	-384.3697	
PV Unit electricity exported	-167.3972	0.4591	-76.8518	
Total			-461.2214	(283)
Total Primary energy kWh/year			5010.6813	(286)
Target Primary Energy Rate (TPER)			97.1100	(287)